

1           1. A method of estimating a pose of a human head in natural scenes comprising  
2           the steps of:

3                     generating, a sparse representation of a human face;

4                     training, the sparse representation to a set of face(s) in known poses; and

5                     determining, a pose of a head by comparing the trained representation(s)  
6                     to a facial image.

1           2. The method according to claim 1 further comprising the steps of:

2                     transforming a raw facial image into sets of vectors representing fits of the  
3                     face to a random, sparse set of model configurations (the sparse  
4                     representation).

1           3. The method according to claim 2 wherein the transforming step further  
2           comprises the step of:

3                     collecting, salient features of the face image which are useful to estimate  
4                     the pose of the face.

1           4. The method according to claim 3 wherein the transforming step further  
2           comprises the step of:

3                     suppressing, irrelevant variations of face appearance.

1        5. The method according to claim 4 wherein the training step further comprises  
2        the step of:

3                learning, using Support Vector Regression (SVR), a relation between the  
4                sparse representation and the pose(s).

6. A method of estimating the pose of a human head in a natural setting  
comprising the steps of:

5                constructing, a set of sparse representation filters (SRF) to accumulate  
                 edge response along a boundary of a facial landmark, shaped such  
                 that the response is smooth with respect to the changes in the position  
                 and the shapes, between a model and image data;

                 applying, SRF to training images producing  $SRF(I_\alpha)$ ;

                 training the relation  $SRF(I_\alpha) \rightarrow pose(I_\alpha)$ ;

                 determining a sparse representation  $SR(J_\alpha)$  for each subject image  $J_\alpha$ ;

10                and

                 determining, a pose of the subject image.